

SPECIAL MEETING.

Fifth Session, 29th May, 10 o'clock, A. M.

Dr. BACHE, Vice-President, in the Chair.

Letters were read from Professor Bartlett, of West Point,—Professor Caswell, of Brown University,—and Professor Locke, of Cincinnati.

Dr. Samuel George Morton, of Pennsylvania College, read a "Summary of his Series of Observations on Egyptian Ethnography."

Dr. Morton stated, that having from time to time communicated the result of some inquiries into Egyptian ethnography, he took the present occasion to present a summary of his observations, in connexion with a part of the data from whence they have been derived. Dr. M. then submitted to the inspection of the Society twenty embalmed heads from the Egyptian catacombs; being part of a series of one hundred, sent him by George R. Gliddon, Esq., during the period in which that gentleman held the United States' Consulate at Cairo. They were obtained from seven different sepulchral localities, upwards of six hundred miles apart, beginning at the Memphite Necropolis in the north, and terminating at the ruined temple of Paremboule, in Nubia.

Dr. M. then observed, that a careful analysis of these remains had enabled him to refer them to two of the great races of men, viz. the Caucasian and the Negro, although there is a remarkable disparity in the number of each. Again, the Caucasian skulls vary so much among themselves, as to present several different types of this race, which have been heretofore mentioned in the Society's Proceedings for November and December, 1842.

1st. The *Pelagic form* of the head, or that which most nearly resembles the conformation of the people of Western Asia and Southern Europe. The Pelagic head is familiar to us in the beautiful models of Greek sculpture, which are remarkable for the volume of the head compared with that of the face; the symmetry and delicacy of the whole osteological structure, and the largeness of the facial angle.

2d. The *Semitic form*, as seen in the Hebrew communities, has

been characterized from remote antiquity by a receding forehead, long, arched, and very prominent nose, a marked distance between the eyes, and a strong development of the whole facial structure.

The number of heads conforming to the Pelasgic and Semitic types,—for which Dr. M. on a former occasion suggested the provisional name of *Arcto-Egyptian* group,—is fifty-one, or a fraction more than one-half of the whole series. It is moreover remarkable, that the physiognomy of the ruling caste of the Egyptians, as seen in the portraits yet preserved in the paintings and sculpture of their temples, corresponds in a remarkable manner with the character of the head and face of the Pelasgic series of mummies. Thus the portrait of Amunoph 1st, the oldest which has hitherto been identified, presents the finest cast of European features; and yet this monarch reigned in the valley of the Nile, and held his court in Memphis, more than eighteen centuries before the Christian era: and if from this remote period, we trace the physiognomy of the kings and queens of the subsequent reigns, we perceive among them many equally beautiful models of the human countenance, some of which are not inferior to the beau-ideal of classic art.

3d. The *Austral-Egyptian* group embraces that modification of the Caucasian type which is seen in the Hindoos and Southern Arabs, blended with some peculiar traits which may have pertained to the aboriginal inhabitants of Meröe. The head is smaller than in the Pelasgic type, and the forehead narrower; while the face being more prominent, the facial angle is rather less. The nose is straight or aquiline, the face angular, and the features often sharp. This modification is also frequent on the Egyptian monuments, occasional, for example, in the ruling caste, but very frequent among the subordinate classes.

Dr. Morton next proceeded to speak of the *Negro* race, of which but a single unmixed and unequivocal example occurs in the entire series; and this one is not from any of the catacombs, properly speaking, but from a tumulus proximate to Philæ, on the frontiers of Nubia; a spot which is supposed to have been a receptacle for the people of all nations who chanced to die while in attendance at that celebrated shrine. But although the unmixed Negro occurs but once in the series, there are eight other heads which possess decidedly blended characters in which those of the Negro predominate. For these the author has proposed the name of *Negroloid* heads; for while the osteological development and the very *expression* of the bones are that of the African, the hair is long and rather harsh; thus

indicating that combination of features which is familiar in the mulatto grades of the present day, and which is also characteristic of a part, at least, of the modern Coptic population of Egypt.

After illustrating these varied conformations by means of the embalmed heads already alluded to, Doctor Morton submitted a revised ethnographic table of the whole series of Egyptian crania, according to the *preponderance* of physical or organic characters, as follows:—

1. Heads of the Pelasgic type,	-	-	-	44
2. Heads of the Semitic type,	-	-	-	7
3. Heads of the Austral-Egyptian type,	-	-	-	33
5. Negroloid or Coptic heads,	-	-	-	8
6. Negro,	-	-	-	1
4. Austral-Egyptian heads, with traces of Negro lineage, and some other but indeterminate traits,				5
7. Idiotic heads, race uncertain,	-	-	-	2
				100

He then submitted the following additional observations derived from the materials in his possession:—

1. The internal capacity of the cranium, (which of course indicates the size of the brain,) measures ninety-seven cubic inches in the largest Caucasian head, and sixty-eight in the smallest; and the average derived from the three divisions of this race will not, perhaps, exceed eighty-five cubic inches. The few Negroloid heads give an average of eighty cubic inches, and the single unmixed Negro but seventy-one. Thus the brain, in each series, presents a smaller average size than is characteristic of any of the corresponding races of the present day.

2. The Facial Angle gives the following measurements:—

Average of the Pelasgic series,	-	-	-	80°
Average of the Austral-Egyptian series,	-	-	-	78°
Average of the Negroloid series,	-	-	-	75°

3. Position of the Ear. The singular elevation of the ear, so familiar in Egyptian statues, bas-reliefs and paintings, is not confirmed, as a natural organization, in this series of heads. The bony meatus presents no deviation from the usual relative arrangement of parts;

but the *cartilaginous* structure being desiccated, and consequently contracted, may not afford satisfactory evidence.

4. The observation of the late venerable Professor Blumenbach in respect to the *incisor teeth* of the Egyptians,—viz. that, in comparison with those of other nations, they were large, thick, and cylindrical, or obtusely conical, instead of having the characteristic chisel-like form,—is not confirmed by the present investigation. For among upwards of two hundred teeth of this class, derived from forty-five different crania, there does not appear to be any deviation from the ordinary form or structure; and the conical appearance of the crowns of the teeth has obviously resulted from the habitual mastication of hard substances, and is common in the Hindu and other nations, in whom it is derived from like causes.

5. The Hair is preserved on thirty-six heads, in some instances in profusion, in others scantily, but always in sufficient quantity to permit an examination of its texture. Thirty-one pertain to the Caucasian race, and in these the hair is as fine as in the fairest European nations of the present day. Of the eight Negrolloid heads, those which retain the hair have it comparatively coarse, but not woolly, and in one instance it is nearly a foot in length. In the solitary Negro head, the hair is too characteristic to be mistaken.

6. These materials, in conjunction with monumental evidence, go to establish the antiquity of those physical or organic characters which constitute the differences among the several races of men; and show us, by direct and unequivocal contrast, that these differences are as old as the oldest records of our species.

7. The origin of this extraordinary people has hitherto been one of the most difficult problems in ethnography; and this difficulty has chiefly arisen from the fruitless effort to trace to a single source that nation, which derived its origin, as we have seen, from several distinct branches of the human family.

Mr. Job R. Tyson read a paper on “The Social and Intellectual State of the Colony of Pennsylvania, prior to the Year 1743.”

In this essay, Mr. Tyson considers the social condition of the founders and early inhabitants of Pennsylvania, and traces their progress in scientific and literary pursuits up to the organization of the American Philosophical Society, in 1743. It is evident, he says, that such an association as this must have been the result of præx-

isting causes, and that the success which has followed it must be less owing to the happy or fortuitous circumstances which attended its birth, than to the steady operation of other influences, which were coeval with the establishment of the English province.

The subjects of Gustavus Adolphus, who, before the middle of the seventeenth century, alighted on the shores of the Delaware, seem to have been a frugal, honest and worthy race; but I cannot find, said Mr. T., that either they or their Dutch invaders paid much attention to the interests of learning. The colony of New Sweden was small in number, the inhabitants extremely illiterate, and its social state one of unattractive rudeness, of unalloyed but rustic simplicity.

The English settlement by Penn was more numerous, and projected with loftier aims. It occurred at a propitious period, and under circumstances favourable to the development of a healthy national character. The civil wars of England, and the great rebellion in which they terminated, were past. The fury of religious persecution was stayed, and the heat of religious controversy, though still excited and feverish, was not as before to be quenched by blood. A new order of men had arisen out of the burning cauldron of puritanism, which, though partaking of the puritan leaven, was tempered by cooler heads and milder tenets. The Quaker sect, at the head of which stood Robert Barclay, William Penn, George Whitehead and others, proclaimed to all—even to the hunted Jew and proscribed Mahometan—the novel doctrine of universal toleration, and united with this sentiment a great variety of opinions, deemed subversive of existing dogmas, and threatening the privileged orders of the Church and State of England.

In order to reduce some of these principles to practice, Penn accepted in 1681 a charter of Pennsylvania from Charles II. Thither he repaired in the succeeding year with such companions and followers, as animated by the hope of improving their decayed fortunes, or induced by the adventurous spirit of change, or anxious to enjoy their religious tenets freed from the oppressive or uplifted hand of secular authority, were willing to encounter the austerities of a residence in the new and remote regions of the west. Here the liberal principles of the founder were to stand the trial of experiment. The problem was to be solved, whether government, exposed to the billows and inundations of the democratic element, and subjected to the dangers of unfettered religious opinion, could subsist without the nutriment of a hierarchy, without the distinction of caste, and without the aid of privilege.

As all religious professors were equally entitled to protection by the great law of 1682, multitudes flocked to the new settlement. But notwithstanding the freedom which was allowed to discussion and conduct, and the constant influx of strangers from England and the neighbouring colonies, it does not appear that religious controversy engaged much of the colonial mind, or that with the exception of the Keithian schism, diversities of sentiment estranged the affections or excited the passions of the people. The minds of the settlers, thus left free to think and act without the apprehension of restraint, or the dread of a superior, directed their powers fearlessly to the question of government, to the melioration of their physical state, and to the improvement of their moral and intellectual condition.

— nec verba minacia fixo
 Ære legebantur; nex supplex turba timebat
 Judicis ora sui.—Ov. MET.

The early emigrants included in their number men of good educations and high endowments. Penn himself was a scholar and a writer; his mind was of a sagacious and original order, and enriched with various and profound knowledge. Thomas and David Loyd, Makin, Pastorius, Kelpius, Hamilton, Logan, Norris, Brooke, Keith, and many others who could be named, were men of considerable classical attainments. It is enough to say, that the mathematics and ancient languages were taught in the Friends' Public School; that the genius, scenery and peculiarities of the province were soon celebrated in Latin verse; and that the Roman and French tongues were, on one occasion at least, resorted to as the mediums of intercourse between the English and German emigrants.

A printing press was in operation in Philadelphia, so early as the year 1686. This was only four years after the settlement by Penn, while the forests were standing in primeval wildness around the colonists, and before huts were substituted for the caves which first sheltered them from the inclemencies of winter. In all the other colonies, this engine of mind was postponed till the asperities of a new country were subdued by longer cultivation, or until physical ease gave more leisure to seek for mental conveniences. In Pennsylvania, the cause of education and the diffusion of knowledge by means of printing, were cotemporary with the landing. The following year (1687) is signalized by the printing of an *almanack*. This performance was from the printing house of Bradford, and is remarkable as one of the first emanations of the Colonial press. In conformity with a provi-

sion in the frame of the Government, a school was opened in the next year after the landing (1683), and in six years afterwards was established a Friends' Public School, where the poor were taught gratis, and sound literary and scientific learning was open to all. The preamble to the charter, which was granted to this seminary in 1701, shows the high aims of the colonists with respect to mental culture. It recites that the prosperity and welfare of a people depend mainly upon the good education of youth, and that the qualifications for public and private usefulness are chiefly derived from learning to read and write, and from "the learning of languages and useful arts and sciences, suitable to their sex, age and degree," &c.

James Logan accompanied the proprietary on his second visit to the colony, in 1699. His valuable treatises in Latin, and his English translation of Cicero's little work, *De Senectute*, are well known. These have given to posterity additional evidence, if any were wanting, of his devotion to literature and science. With great liberality, he bequeathed the books known as the Loganian collection of the Philadelphia Library to the city, "for the advancement and facilitating," as he observes, "of classical learning." He was fifty years in forming this library, which numbered nearly four thousand volumes at his death. It included one hundred folio volumes, in Greek, mostly with versions. The Roman classics were among them, "without," he says, "an exception." All the Greek mathematicians, Archimedes, Euclid, Ptolemy, &c., had a place, besides a great number of modern mathematicians. In addition to standard works of enduring value, many rare and curious volumes are to be found in this collection, which, at the present time at least, to use his own expression, "neither prayers nor price could purchase."

In the year 1719, the first newspaper was published in the colony of Pennsylvania, under the title, "The American Mercury." The Boston News Letter, undertaken and published in the year 1704, at Boston, by John Campbell, a Scotchman, claims the undeniable distinction of being the first newspaper which appeared in either of the North American colonies. Though Pennsylvania, which is half a century younger than Massachusetts, must yield this honour to her elder sister, yet the priority is a period of only fifteen years, and at Philadelphia was published the first *daily* newspaper which appeared on the continent.

Four years after the commencement of "The American Mercury," Franklin appeared, a poor and friendless boy of seventeen, in possession of a trade about half taught, in the streets of Philadelphia. Be-

fore I refer to the history of this remarkable man, or the effects which his presence and exertions produced upon our institutions, it may be proper to show how circumstances contributed to his success.

We have seen that the leading minds of the first settlers were scholars; that the means of common and scholastic education were amply provided; and that zeal and enterprise in the cause of learning were exhibited in the early establishment of a printing press, and in a variety of literary performances. It remains to be shown, that the principles of the colonial policy had concurred with these causes, in diffusing a self respect and spirit of generous rivalry among those classes of society, to which in other countries they were strangers.

Among the beneficial influences which the Society of Friends exerted upon the infant colony from its establishment, were the recognition of usefulness in occupations, simplicity in living, and equality in classes. As these principles were engrafted in the maxims of their religious profession, they taught that each was to be deduced as a corollary from the humility of the Christian character. The callings of men however humble or laborious, were not permitted to detract from their social standing; and frugality in living and simplicity in furniture and dress were enjoined on all their members, without reference to their pecuniary means of indulgence, or their taste for luxury or expense. Those arts which merely embellish life, and add to our enjoyments in the gratification of the senses, were decried. Nothing was deemed meritorious, or voted to be respectable, but that which could be made subservient to the great purposes of utility or practical convenience.

They taught that as trades and manual labour were useful, assiduity in their prosecution was honourable. William Penn recommended trades to his children. Other leading Friends, whose ancestors, claiming for the most part a cavalier descent, had always belonged to the best classes of English society, adopted his sentiments, and set the example of bringing up their children to some useful or handicraft employment.

The necessities of a new country gave force to these suggestions, and induced their extensive adoption by the colonists. The effect of such views upon a society, in which existed no titular ranks, except those which must result from the inevitable subordinations of social and political life, was pervading. The principle had its origin in religious faith, and that only, without looking to political consequences. While this principle left the claim of conventional honour untouched, it raised to respectability a class of men, whose ignorance and occu-

pations had before consigned them to the evils of neglect and a chilling sense of inferiority. Birth and employment came to be disregarded in the estimate of personal character. However humble and depressed both might have been esteemed elsewhere, they presented no obstacle in Pennsylvania to advancement and consideration. Perhaps no event in history has tended so much to the real elevation of the working classes as the religious maxims and social scheme of Penn and his companions in the Province of Pennsylvania.

All this had the salutary effect of bringing the different classes of society into closer union. The social manners of mechanics, condemned in England to isolation, were improved; and their prevailing sympathies and impulses softened and enlarged. They were soon taught to feel the advantages of scientific knowledge to the manual arts, and to see the connexion subsisting between them. The mechanic of Pennsylvania thus became a different sort of person from the mechanic of other countries. Many of her practical farmers and unambitious tradesmen were the offspring of refined and educated parents, who, in training the hands of their children to labour, did not forget the cultivation of their minds, nor the improvement of their religious and moral faculties.

So universal was the adoption of trades in the colony, either with or without some other employment, that few exceptions occur until after the middle of the last century. The placid surface of the social stream became disturbed in the tumults of the revolution, and in the upheavings caused by war, the filth and deposits of the current, whose natural resting place was the bottom, sometimes mounted to the top. It was thus that social as well as political life underwent a change.

Tantæ molis erat Romanam condere gentem.

ÆN.

In the excitements of a momentous contest, in the more enlarged views which its successful issue presented, in the rivalry and competitions for political office, and in the diffusion of more luxurious tastes and habits, the primitive ideas of devotion to practical husbandry and the mechanic arts gave place to the engagements of commerce, and thence to the more ambitious and ornamental pursuits of life. But the principle in its native integrity was preserved, and is still exemplified by many members of the religious sect in which it originated.

In connexion with the ideas of frugality, simplicity and utility inculcated by the first colonists, it must not be forgotten that they were equally diligent in cultivating the benevolent principles of man, which

they sought to awaken by private opinion and nurse by the stimulus of keeping them in constant exercise. The value of physical means, appliances and instruments in the government of the world, was depreciated; the animal instincts and propensities were to be subdued, if not extinguished. In pursuance of this scheme, they denounced war and fighting: they condemned the severity of the lash and other modes of physical torture in the punishment of offenders; and declaimed against capital inflictions. Instead of these, they set about mitigating the rigour of the penal code: jails were reformed and meliorated, and charities founded for the poor and unfortunate.

The system of African slavery found no support, and as practised, no sympathy nor encouragement from William Penn; and his brethren of the province, after long continued and ineffectual remonstrance, finally determined, in the early part of the eighteenth century, to exclude from religious fellowship such of their members as were concerned in the traffic. Pennsylvania owes to her Quaker colonists,—especially to her founder,—to Southey, Sandiford and Lay,—to Elisha Tyson, Anthony Benezet, and John Woolman,—the worthy distinction of setting an example to the other states of the Union, of so modifying her system of domestic servitude as to bring about, in a few years, its gradual but final extinction. This memorable event took place in the year 1780.

Whatever may now be thought of some of the theories advanced by the Quaker puritans of that day, it must be admitted that ideas growing out of reflections upon our moral being, and based upon the improvable capacities of our moral nature, could only spring from minds enlarged by study and refined by general cultivation. It is to these causes we owe the numerous charitable foundations for which Pennsylvania is so honourably distinguished, and the celebrity she has long enjoyed for her mild punishment of offenders, and the latest improvement of her penitentiary system.

It is not surprising therefore that Franklin, on his arrival in Pennsylvania, should find apprentices whose aspirations were equally generous with his own. When he founded with characteristic sagacity that remarkable union, the Junto of 1727, those who sympathised in his project were mostly mechanics, and brought up in the same sphere of life with himself. The members of the association were to be confined to twelve in number, but according to Franklin's account, the original number of those who were actually enrolled, was eleven. Of these, Thomas Godfrey was a glazier, William Parsons, a shoemaker, William Maugridge, a joiner, and Hugh Meredith

and Stephen Potts "were bred to country work;" but at that time, the former was engaged "to work at the press," and Potts was at bookbinding. Of the other five, Joseph Breintnall was "a copier of deeds for scriveners;" Nicholas Scull was a surveyor; George Webb is described as "an Oxford scholar," but his time, for four years, had been purchased by Keimer, the printer; William Coleman was then a merchant's clerk, and Robert Grace was a young gentleman of some fortune. These, with Franklin himself, the author of the society, who had been struggling with penury as a journeyman, but who now was a *master* printer, comprised the company. The promiscuous association of different classes, as displayed in the occupations of the members,—classes, which, in Europe, had seldom come into contact with each other,—cannot escape notice. No doubt the social fusion which it evidences, was promoted by the commanding intellect of the man who planned the enterprise; but more certainly may be ascribed to the amalgamating properties of other and antecedent elements. The notion of transmitted and hereditary virtue, however we may condemn it as absurd and unphilosophical, cannot be overcome by suggestion, or obliterated in a few years. In Pennsylvania, the original structure of the social state had been placed upon new foundations, and leaned for its support upon reason and principle, not upon the fallacies and delusions of prejudice or the maxims and examples of antiquity.

The members of the original Junto were ingenious men, whom the love of knowledge had assembled, and whom the most generous aspirations cemented together. I will not repeat what is so generally known respecting their characters and attainments; as the delightful autobiography of Franklin himself, who has characterized each, and the volumes of the Historical Society of Pennsylvania, furnish very copious information.

From the ingredients of the Junto, as well as from the contents of the Logan library, it is evident that light literature and graceful verses did not absorb the mind of the province. The satire of Young against a pursuit of the muses had appeared, and though it was caustic enough for so poetical a temperament, it could not eradicate a taste already formed. Mr. J. F. Fisher has shown that many of the colonists cultivated the muses with very tolerable success. But the tendency of the colonial mind was to useful acquisitions in science. This arose from the convictions of our ancestors, already referred to, that the elegant and ornamental arts were worthy of little encouragement and care. Education was too generally disseminated

to permit the extinction of a classical taste ; but though versifiers occasionally appeared, and a love of light literature was widely diffused, yet the energies of the youthful province were reserved for pursuits more congenial with practical exigencies and the predominant feelings of the country.

We have seen that the Junto was formed in the year 1727. In the following year, Makin wrote his Latin poem, entitled, "*Encomium Pennsylvaniae*," to which succeeded, in the year 1729, his "*Descriptio Pennsylvaniae*." These verses are not without merit as metrical compositions, and show at least that the author had studied the classical productions of Rome, and understood the structure and prosody of the Latin tongue. The Library Company of Philadelphia was started two years after, in 1731, and had its origin, under the auspices of Franklin, in the desire of the Junto to have a permanent collection of books for the benefit of its members. This Library, it may be observed in passing, though now unequal to the literary wants of Philadelphia, has risen to an importance far exceeding in number and value any other bibliothecal repository in the United States. It certainly argued a diffusive zeal for knowledge, that in an infant and sparsely populated colony, fifty original subscribers, and they "mostly among young tradesmen," could be obtained for such an enterprise, with the expectation that an annual contribution would be required for the space of half a century. In 1741 was attempted a Magazine, which is the first effort in any of the colonies to establish a literary journal. In the following year another newspaper was established in Philadelphia. About this time it was that James Logan published at Leyden several works in Latin on different branches of science, and in the province his English translation of Cicero on Old Age; that Thomas Godfrey, the author of the quadrant, was prosecuting his ingenious and scientific labours; and that John Bartram, whom Linnæus justly pronounced the greatest natural botanist in the world, was earning honour from his sovereign, and fame from the learned societies of Europe. These and kindred occurrences prepared the way for further events. In the year 1743 an Academy was suggested, which grew into a great literary and medical university, whose well earned and unrivalled eminence has long been a source of cherished and honourable pride to Pennsylvania; and the same year witnessed the formation of the Philosophical Society, whose centennary we have just celebrated.

Many original works were published before the era of 1743, of which a considerable number is still preserved in the City Library.

There are now on the shelves of that institution above four hundred original books and pamphlets, which were issued by the Philadelphia press before the revolution. A multitude of domestic productions are no doubt lost, and if we add the reprints of foreign books, in which, at all periods, our press was prolific, the number of works printed in the colony may be estimated much beyond what is generally imagined.

The aim of this paper, said Mr. Tyson, is accomplished, in showing that in the year 1743 the formation of such a society was not forced or premature, but that amid the general culture and scientific predilections of the colony, it was as natural, as it was certainly important, to combine and concentrate intellectual exertion. Like the other institutions, which the mental wants of the country demanded, it became itself the nursing mother of our infant science and the great distributor of its scientific wealth.

Mr. Tyson closed his essay by sketches of the character and habits of a few of the more distinguished members of the Society of 1743.

Dr. Meigs read a communication, entitled, "Measurements of the Fœtal Cranium, by Charles D. Meigs, M.D., Professor of Obstetrics, &c. in the Jefferson Medical College."

He stated it to be universally admitted by medical writers, teachers and practitioners, that it is important to know the dimensions of the head of the child at birth. Without correct information upon this point, the operations of the surgeon would be still more difficult, dangerous and uncertain, than they necessarily are even with the most accurate knowledge of the form, size, and resistance of the fœtal cranium, and the relative magnitude of the pelvis.

Having been himself employed for some years in this department of surgical pursuits, he had long supposed that the estimates of writers and teachers upon the point in question were less accurate than they ought to be; since he had observed the size of the cranium to be greater than is generally allowed.

Dr. Meigs was not prepared to say, that the calculations made in other places might not be just for those places; but he was convinced that they are too low for Philadelphia, and probably for the United States. He knew of no measurements taken in this country, and therefore hoped that his might be not unacceptable to the Society.

Having provided himself with what is called a pillar compass,—so called by the trade,—and which is a most convenient and portable caliper, he applied it in succession to the heads of one hundred and fifty

children born at *term* under his care. After using the compass as a calliper, the points were pricked into a slip of paper, and then, being carefully measured upon a scale of inches and twelfths or lines, the several diameters were entered into a book of record, whence they were taken to make out his tabular statement.

Dr. Meigs presumed, that one hundred and fifty measurements might be taken as sufficient to give a valid mean of dimensions; yet it would be better to get such mean from one thousand or from one hundred thousand. He stated, that he should probably continue the habit which he now had, of measuring the crania of children born under his care as surgeon accoucheur.

It would be observed, he added, that he had taken only two diameters—the *occipito-frontal*, and the *bi-parietal*—the former extending from the most projecting part of the forehead to the occiput, and the latter from one parietal protuberance to the other.

He had taken these only because he deemed them mainly important. From the transverse we have the perpendicular, as well as the smallest circumference, while the occipito-frontal diameter gives us also the horizontal circumference.

The occipito-frontal diameter is too variable to make it useful to get a mean of its length, as it may differ more than three inches from its normal length under circumstances of very protracted or violent labour.

Dr. Meigs remarked, that before presenting his tables to the Society it seemed proper to say something as to the diameters allowed by other persons, in order that they might be compared with his own results.

<i>Observers.</i>				<i>Measurements.</i>	
				Occip. Fr.	Bi-parietal.
Dr. Burns,	-	-	-	4.	3.3 to 3.6
Blundell,	-	-	-	4.	3.6
Ryan,	-	-	-	4.6	3.6
Ashwell,	-	-	-	4.	3.3
Ramsbotham,	-	-	-	4.6	3.6
Baudelocque,	-	-	-	4.3	3.4-6*
Maygier,	-	-	-	4.6	3.6
Madame Boiorn,	-	-	-	4.3-6	3.4-6
Charley,	-	-	-	4.	3.3-6
Gardien,	-	-	-	4.	3.6

* N. B.—The Paris inch is 1.065977; the English inch being regarded as 1.0.

Dugés,	-	-	-	4.	3.3
Velpeau,	-	-	-	4.	3.6
Moreau,	-	-	-	4.3	3.3-9

MM. Lallemand and Franc, editors of M. Dugés' *Man. d'Obst.* p. 68, say that they carefully measured the diameters in twenty-six children at birth, and found that for the

Occ. frontal, the mean was	-	4.1
Bi-parietal, „	-	3.4
The maximum	-	4.3
Minimum	-	3.6

Dr. M. then presented a tabular statement of the measurements of one hundred and fifty heads of children, born *at term*, in the city of Philadelphia. It appeared from this:—

1. That the sum of his measurements of the occipito-frontal diameter was 729 inches, 7 lines; the mean 4 inches, 10 lines.

2. That the sum of his measurements of the bi-parietal diameter was 586 inches, 7 lines; the mean 3 inches, 11 lines.

3. That in 52 children, the occipito-frontal diameter was more than 5 inches, in 11 it was 5.1, in 8 it was 5.2, in 3 it was 5.3, in one 5.4, in one 5.6, in two 5.7, and in one 5.10.

4. That in 68 the bi-parietal diameter exceeded 4 inches, in 19 it was 4.1, in five 4.2, in six 4.3, in three 4.4, in one 4.5; in only one case was it less than 3.6: in that it was 3.4.

5. That the mean horizontal circumference of the head was 13.8, and the small or perpendicular circumference 11.5.

Dr. Meigs concluded with remarking, that perhaps in an ethnographical relation his measurement might possess a certain interest. It would be curious to preserve, from century to century, some accurate registers of the kind; and he ventured to hope, that upon many succeeding centennial sessions of the American Philosophical Society future members might be induced to present similar records.

Mr. Boyé read a communication “On the Conversion of Benzoic Acid into Hippuric. By James C. Booth and M. H. Boyé.”

Wohler was the first to observe, that on administering benzoic acid to a dog, it was converted into an acid resembling hippuric acid. Ure afterwards found hippuric acid in the urine of a patient who had

taken benzoic acid, and as he could discover no uric acid in the urine, he thought that this last was employed in the conversion of benzoic into hippuric, and recommended the former as a remedy for calculous concretions of uric acid. Keller, induced to undertake some experiments at the instigation of Wohler, found that by taking benzoic acid it reappeared in the urine as hippuric; that it continued as long as he continued the use of benzoic acid; that the urine contained both uric acid and urea; and that it could be inspissated without depositing hippuric acid, unless chlorohydric acid were added, showing that it was combined with a base.

The authors repeated Keller's experiments, and found that when the benzoic acid was taken after a meal, the uric acid which at first occurred in the urine did not diminish by the appearance of the hippuric, and that the uric still exhibited itself even during the subsequent continuance of the benzoic acid. The urine may be inspissated to a syrupy consistence without depositing hippuric acid or its compound: upon separating the syrup from the deposited salts, and shaking it with a mixture of 2 ether + 1 alcohol, urea is dissolved without any hippuric acid, while 1 ether + 1 alcohol dissolves both urea and the hippurate, but the former in so much larger proportion, that the hippurate is eventually extracted free from urea. The hippurate then proves to be a compound of the acid with ammonia.

The authors draw the following conclusions from their experiments:—

1. That the formation of uric acid in healthy urine is not affected either in regard to its quantity, or to its external properties in general, by the introduction and transformation of benzoic acid into hippuric acid in the system.
2. The time required for the benzoic acid to pass through the system, and reappear as hippuric in the urine, is from twenty to forty minutes after its introduction with food into the stomach. Its occurrence continues for four to eight hours, but then ceases.
3. The quantity of hippuric acid obtained from urine is greater than that of the benzoic taken. In round numbers it may be stated to be one-third more.
4. Urea is not in combination with hippuric acid in the urine.
5. The base with which hippuric acid is combined, and which keeps it in solution, is ammonia.

Mr. Simeon Borden, of Massachusetts, presented a communication entitled, "Comparison of the Dimensions of the

Earth, obtained from Measurements made in the Survey of the State of Massachusetts, with accredited Mean Determinations."

In this paper Mr. Borden deduces the length of the meridional degree, the length of a degree perpendicular to the meridian, and the length of a degree of the parallel, for latitude $42^{\circ} 21' 30''$, from Professor Bessel's corrected elements of the magnitude and figure of the earth, derived from ten principal geodesical surveys, and compares these with the results of similar deductions from elements derived from the Massachusetts survey. He gives the results of his comparisons as follows:—

Equatorial radius of the earth, according to

Bessel,	20923597.14 feet, or 3962.803 miles.
Mass. survey,	20921935.54 ,, 3962.487 ,,
Difference,	1661.6 ,, 0.316 ,,

Polar semi-axis, according to

Bessel,	20853657.16 feet, or 3949.556 miles.
Mass. survey,	20850374.32 ,, 3948.935 ,,
Difference,	3472.16 ,, 0.621 ,,

Length of degree of meridian, for lat. $42^{\circ} 21' 30''$, according to

Bessel,	364403.28 feet.
Mass. survey,	364356.0 ,,
Difference,	47.28 feet.

Length of degree of perpendicular, for lat. $42^{\circ} 21' 30''$, according to

Bessel,	365740.21 feet.
Mass. survey,	365724.00 ,,
Difference,	16.21 feet.

Length of degree of parallel, for lat. $42^{\circ} 21' 30''$, according to

Bessel,	270262.09 feet.
Mass. survey,	270250.10 „
Difference,	12. feet.

Mr. Borden, after some remarks in explanation of the manner in which the position of different astronomical stations was determined by Mr. Paine, gives his reasons for rejecting three of his results, as irreconcilable with the rest, and probably referrible to a deflection of the plumb line. He then proceeds to rededuce the latitude of the State House at Boston from a comparison of all Mr. Paine's admitted results. The indiscriminate mean of these fixes it at $42^{\circ} 21' 29''.16$, which differs $0''.84$ from that formerly arrived at by Mr. Borden. A comparison made by Mr. Boutelle of the same results, which gives a weight to each result proportioned to the number of observations on which it is founded, fixes it at $42^{\circ} 21' 28''.809$. On the whole, Mr. Borden is inclined now to assume $42^{\circ} 21' 29''$ as the latitude of the Boston State House, and to correct all the computed latitudes of Massachusetts accordingly, by deducting one second.

The paper is accompanied by an investigation of the ellipse, which contains the formula used by Mr. Borden in deducing the spheroidal elements compared in the earlier part of his communication.

Professor Bache gave an account of an instrument for determining the conducting power of bodies for heat.

The instrument depends upon the same principles with Fourier's thermoscope of contact. A conductor of heat of limited extent exposed to temperatures of different degrees at opposite sides, takes an intermediate temperature between the sources of heat. If the flow of heat on one side be cut off by interposing a substance, of which the conducting power is to be determined, the new temperature assumed by the conducting mass depends upon and measures the conducting power of the body interposed. In Fourier's thermoscope of contact an air thermometer was interposed between two vessels of water heated to different temperatures, and contact with the sheet or lamina of the substance whose conducting power was to be measured was obtained by using a cushion containing mercury. The air thermometer has always been found a very unmanageable instrument, and the mercury cushion secures only a partial contact.

Prof. Bache's thermoscope of contact consists of three compartments, formed by dividing a trough cut in a block of wood by thin partitions of appropriate material. Each compartment is filled in part with mercury, and a thermometer bulb in the centre of each, and nearly filling it, indicates its temperature. A vessel containing ice fits closely to one end of the block in contact with one of the exterior compartments, and another to contain warm water, kept at nearly a constant temperature by a lamp placed beneath, fits closely to the other compartment.

If the resistance to the flow of heat is equal from each of the exterior compartments to the central one, the temperature in it will be the mean between the temperature in the two exterior compartments, though in the apparatus as actually constructed by Prof. B. the relation is purposely made different from this. To measure the conducting power of a thin plate of wood or metal, which mercury does not wet, it is placed in a small groove in one of the exterior compartments, the mercury being in contact with it on both sides. The new temperature taken up by the central thermometer indicates the relation of the resistance to heat of the substances on the opposite sides of the central compartment, and this may be made to measure the conducting power of the interposed plate. Mercurial thermometers of which the degrees are minutely subdivided by verniers were preferred to other modes of measuring the heat; and it was remarked, that as the actual equilibrium of temperature is in general only momentary, varying with the changes of the cold and warm vessels, it is of more importance to have a very rapid than a very minute reading of the scales.

Professor Bache explained how this instrument may be applied to measure the conducting power of substances used for clothing, imperfectly investigated by Rumford,—of various metals, of powders of different kinds, and of fibrous substances; and remarked that a simple modification would render it applicable to the measurement of the conducting power of liquids. Though the principle of contact in the instrument and the other details are essentially different from those of Fourier's instrument, Prof. Bache prefers, in order not to introduce a new name into science, to retain for it the name given by Fourier to his instrument intended for the same purpose.

Professor Bache remarked, that a different view might be taken of the theory of a thermoscope of contact, which would lead to a corresponding modification of the instrument. If a trough containing mercury be heated at one end, the heat will be propagated according to a well known law. If a partition be placed in the trough, a new distri-

bution of temperature will take place, which when compared with the former will give the conducting power of the substance obstructing the flow of heat.

Professor Henry read a letter, addressed to him by Captain Thomas Lavender, of Princeton, N. J., giving his recollections of some water spouts observed by him. The following are extracts from this letter:—

The most remarkable of these was one which passed directly across our ship, the *Huntress*, of New York, bound for China, in June, 1822; we were in the latitude of between three or four degrees north, and longitude of from twenty-three to twenty-five west, which, at that season of the year, was near the northern limit of the south-east trade wind. The ship was sailing on a south-westerly course, with the wind from south to south south-east; our attention was first directed to the spout by a loud roaring noise, and we saw at the distance of about three or four hundred yards, directly to windward, a circular space on the water of about twenty feet in diameter, within which the surface was violently agitated, and appeared to be raised to the height of a foot into a perfectly white foam. We saw no appearance of a cloud above, and no descending column, but this might have been because we were too near the spout; since I have observed, on another occasion, that the regular outline usually described vanishes when the object approaches very near the observer. From its direction when first observed, and our rate of sailing,—about four miles per hour,—it was at first thought that it would pass us two or three hundred yards astern, if it moved in the direction of the wind; but instead of this, it appeared to keep on our beam, and its velocity to increase as it neared the ship. Fortunately, all hands were on deck at the time; and when it became evident that it would strike the ship, the order was given to lower the sails. Simultaneously with the act of lowering them, we felt the effects of the spout. The ship was thrown over in an angle of fifty degrees with the horizon, as if by a wind directly from the spout. It passed across the ship in from ten to fifteen seconds, during which time we were wet with a hard shower of rain composed of very large drops of water. As the spout was leaving the ship on the other side, all the sails throughout the whole length of the vessel, say one hundred and sixty feet, were thrown aback by a wind from the spout in an opposite direction, and the ship was inclined into an opposite angle of about the same number of degrees as before.

The action of the spout appeared to be very much circumscribed, since we did not feel the wind from it until the agitation on the water approached within twenty yards of the side of the vessel. The effect appeared to continue longer as it was leaving us than it did when it was approaching. After leaving the ship, it was observed to move in the general direction of the wind; but it appeared to have lost considerable of its force, and did not make as great an agitation on the water as before.

The time was about sundown; the day had been squally until within an hour or so, when the weather cleared off with passing clouds. No whirling motion was observed; the continued noise and the circular spot on the water were the only effects noted until we were struck by the wind.

Three years previous, while in the Straits of Gaspar at the entrance of the China Sea, we saw fourteen water spouts in the course of an hour. One of these, and the largest I ever saw, was within two hundred yards of the ship. Its action on the water covered a circular space, I should say, of one hundred feet in diameter; it was furious, and threw up a cone of spray quite dense, of from three to four feet in height, something like a large sugar loaf. It commenced and exhausted itself on the same spot: no wind was felt from it, and the ship was becalmed the whole time, although a heavy rain was falling on us, which was not however of the same intensity continually: when the spout subsided, the rain ceased. We fired a number of shots from a six-pounder directly through it, without any apparent effect. The interest of the scene was much increased by the presence of another ship, which was also occupied in the endeavour to dissipate other spouts by the same means. Indeed we both became so much engaged in this work, that each ship was endangered by the balls from the other.

On another occasion, off the Cape of Good Hope, we saw a spout fully formed at the distance of about a mile. It presented the usual appearance of a cloud above, with a spiral waving column reaching down to the water, and agitated by a continued motion like that exhibited by a piece of twisted glass turned on its axis before the eye. Its motion towards us being slow, we secured all the sails, and watched it with a telescope. When it was at the distance of about one hundred yards, I could see distinctly into the centre of the base; which was perfectly smooth: not a drop appeared to disturb the surface; while without the circle, and all around its circumference, the sea was in bubbling commotion, with large drops of rain falling on it,

some of which reached the ship. No wind was felt from it. The base, I should judge, was about fifty feet in diameter. As it approached us, the distinctness of the outline of the spout became less apparent, and a dilluse mistiness appeared to occupy the place. Its intensity began to decline about the time the telescope was directed towards it, but it continued for some time after in tolerably violent action. It passed us at the distance of about thirty yards astern, where its action ceased in plain sight. The time of day was about an hour before noon.

The foregoing are all the spouts which I recollect, as being very near to us.

Off the Isle of France, one passed apparently across the ship's course at the distance of about a mile astern; the wind blowing a gale from the N. E.; ship steering west. Its direction was not the same as that of the wind, but apparently nearly at right angles to it. Its motion was very rapid; I should think at the rate of twelve miles per hour; and as it crossed our course, it presented the appearance of an immense black snake, with its head in a cloud, its body dragging far behind, and the tip of its tail touching the surface of the ocean.

Mr. Richard C. Taylor made some observations respecting the appearance of certain water spouts which he had observed on the Bahama banks.

During several days in the month of June, 1836, on a voyage from the port of Guiana to Havana, along the north coast of Cuba, the vessel on board of which Mr. Taylor was, was becalmed several days, both on the Grand Bank, and in the main Bahama channel.

During that time, several water spouts appeared around the ship, at from two to four miles distance. Being at the time little conversant with such phenomena, and perceiving that they presented a variety of aspects, Mr. T. sketched, at the moment of their occurrence, three of the most characteristic; each of them occurring on a different day. These drawings he presented to the meeting.

The first of the water spouts occurred about noon, on the 10th of June. By observation, at this hour, the sun's corrected altitude was $89^{\circ} 44'$, and the latitude $23^{\circ} 16'$. The temperature of the air at the moment of observing the water spout was 84° —and the temperature of the water of the sea was 82° . Having never until that moment observed a water spout, Mr. T. was somewhat puzzled at the first glance, to know the true character of the object that thus attracted

his attention. No inverted cone or funnel-shaped mass was remarked. But beneath a very black and not very extensive cloud, two masses or curved columns of misty vapour arose from the surface of the sea, resembling in appearance the smoke of a steam-boat, or rather the two bodies of smoke were separated at the surface by a space which seemed scarcely wider than the breadth of a steamer would appear to be at that distance. The vapour or water of these bodies became momentarily more opaque, and evidently more agitated. What circumstances attended the further progress and accumulation of this disturbed double column, does not appear from Mr. T.'s notes. He perceived no descending column from the overhanging cloud; and it seemed to have suddenly vanished.

The following extracts from his diary were presented by Mr. Taylor:—

11th June.—In only four and a half fathoms water on the bank this morning; the bottom very white, with the coral mud, and the groups of *Fuci* growing upon it, very visible. The thermometer 88° in the forenoon at eleven: at twelve, 90° . Altitude of the sun, $89^{\circ} 41'$, and the latitude, $23^{\circ} 15'$. In deeper water this afternoon, as shown by its dark indigo colour. Storms and thunder all round us this day, but seemed to be at a distance, fortunately.

Another water spout occurred to-day. The same form appeared below, as was seen in that of yesterday, viz., two columns curving outwards. A heavy lowering black cloud overhung the sea; and a dark, conical body, tapering downwards, apparently descended half from the cloud, to meet the ascending columns beneath.

12th June.—Perfectly calm in our position: some rain reached us for a short time: very hot in the middle of this day. Our vessel appeared rather to drift astern, as the fishing lines which had been thrown astern always kept ahead of us during two days. Several water spouts appeared around us. Some of them were bent, and some of them straight. In all cases, the double columns, resembling at first the smoke of fires, commenced below, before any cone passed down from the black clouds that hovered above, to meet them.

Professor Henry made some remarks on the subject of these communications. He thought that sufficient attention had not been paid to the influence of electricity in the production of storms and in the phenomena of meteorology generally. He adverted to the views of Dr. Hare and to those of M. Peltier, who has given a form to the electrical theory, which in

Prof. Henry's opinion is exceedingly ingenious and worthy of attention.

Invitations were presented from Professor Kendall, to inspect the Astronomical Observatory at the High School, and from Dr. Charles Frederick Beck, to examine the compound microscope of Powell and Lealand, belonging to him, after the adjournment.

Dr. Patterson, Director of the Mint of the United States, invited the members and visitors to witness the operations of the Mint, before the meeting of to-morrow morning.

SPECIAL MEETING.

Sixth Session, 29th May, half past 7 o'clock, P. M.

Dr. PATTERSON, Vice-President, in the Chair.

Professor Frazer presented a written communication, entitled, "Transformation of the Series $S = ax + bx^2 + cx^3$, &c., by Professor Theodore Strong, of Rutgers College, New Brunswick, N. J."

It is evident that $x = \frac{1}{\frac{1}{x} - v + v} = \frac{1}{\frac{1}{x} - v + v}$, and if we put $y = \frac{1 - vx}{x}$

or $y^{-1} = \frac{x}{1 - vx}$ (1), we get $x = (y + v)^{-1} = y^{-1} - vy^{-2} + v^2 y^{-3} - v^3 y^{-4} + \&c.$, $x^2 = y^{-2} - 2vy^{-3} + 3v^2 y^{-4} - 4v^3 y^{-5} + \&c.$, $x^3 = y^{-3} - 3vy^{-4} + 6v^2 y^{-5} - 10v^3 y^{-6} + \&c.$, $x^4 = y^{-4} - 4vy^{-5} + 10v^2 y^{-6} - \&c.$, and so on for x^5, x^6 , &c. Hence if we substitute the values of x, x^2, x^3 , &c. in the given series, it becomes $S = ay^{-1} + [-av + b] y^{-2} + [av^2 - 2bv + c] y^{-3} + [-av^3 + 3bv^2 - 3cv + d] y^{-4} + [av^4 - 4bv^3 + 6cv^2 - 4dv + e] y^{-5} + \&c.$; or substituting the value of y^{-1} from (1), we get $S = a \frac{x}{1 - vx} + [-av + b] \frac{x^2}{(1 - vx)^2} + [av^2 - 2bv + c] \frac{x^3}{(1 - vx)^3} + \&c.$ (2), whose law of continuation is evident; and it is manifest that if we expand the functions $\frac{x}{1 - vx}, \frac{x^2}{(1 - vx)^2}, \&c.$, according to the ascending powers of